

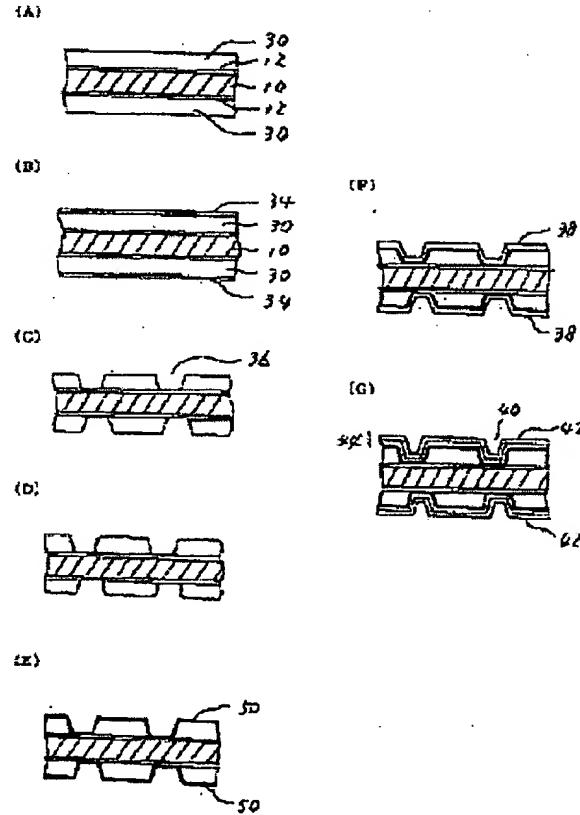
## BUILD-UP PRINTED WIRING BOARD AND ITS MANUFACTURING METHOD

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### Abstract of JP10224036

**PROBLEM TO BE SOLVED:** To prevent the surface of an insulation layer from directly contacting a strong alkali plating liquid on electroless copper plating treatment by forming a metal plating film on the roughening surface of the insulation layer by oxidation electroless metal plating treatment. **SOLUTION:** In a copper-clad lamination plate 10, a copper foil 12 is laminated on both surfaces of an insulation substrate, thus forming a first circuit pattern. An alkali development type photosensitive insulation resin is applied to the inner surface of the copper-clad lamination plate 10 and is dried and cured properly, thus forming an insulation layer 30. Then, after the surface roughening, oxidation electroless nickel plating treatment is performed, thus forming a nickel plating film 50. The thickness of the nickel plating film 50 is determined by considering that the roughening surface of the insulation layer 30 does not directly contact a strong alkali plating liquid on later-process electroless copper plating treatment.



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(54)【発明の名称】 ビルドアッププリント配線板およびその製造方法

(57)【要約】

【課題】 密着信頼性の高いビルドアッププリント配線板を提供する。

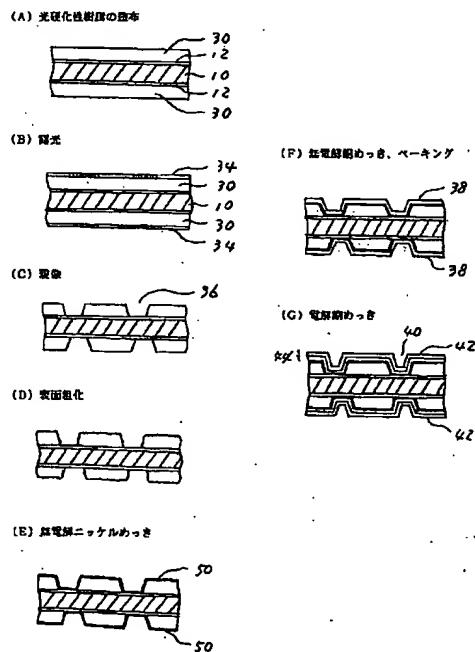
【解決手段】 次の工程を有するビルドアッププリント配線板の製造方法により解決する。

a. 第1回路パターンを形成した銅張り積層板にアルカリ現像型の感光性絶縁樹脂を積層して絶縁層を形成する工程。

b. この絶縁層の表面を粗化する工程。

c. この絶縁層の粗化表面に酸性無電解金属めっき処理を施して金属めっき膜を形成する工程。

d. この金属めっき膜の上に銅めっき処理を施して第2導体層を形成する工程。



## 【特許請求の範囲】

【請求項1】 ビルドアッププリント配線板において、少なくとも一方の面に第1回路パターンが形成された絶縁基板と、この第1回路パターンの上に積層された絶縁層と、この絶縁層の上に酸性無電解金属めっき処理を施すことにより形成された金属めっき膜と、この金属めっき膜の上に形成された第2回路パターンとを有することを特徴とするビルドアッププリント配線板。

【請求項2】 ビルドアッププリント配線板の製造方法において、

- a. 第1回路パターンを形成した銅張り積層板にアルカリ現像型の感光性絶縁樹脂を積層して絶縁層を形成し、
- b. この絶縁層の表面を粗化し、
- c. この絶縁層の粗化表面に酸性無電解金属めっき処理を施して金属めっき膜を形成し、
- d. この金属めっき膜の上に銅めっき処理を施して第2導体層を形成する、ことを特徴とするビルドアッププリント配線板の製造方法。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、ビルドアッププリント配線板に係り、特にアルカリ現像型の感光性絶縁樹脂でなる絶縁層と導体回路との密着性を向上させる技術に関するものである。

## 【0002】

【従来の技術】多層プリント配線板の製造方法において、絶縁基板の少なくとも一方の面に回路パターンと絶縁層とを順次積み上げてゆくビルドアップ法が公知である。このビルドアップ法では、絶縁樹脂でなる絶縁層と導体回路との密着性を向上させるためにこの絶縁層の表面を化学研磨して粗化している。

【0003】図2は、このビルドアップ法による多層プリント配線板の製造工程を示す図である。図2において、10は銅張り積層板であり、紙やガラス繊維などの補強材に樹脂を含浸させたシート(プリブレグ)を重ね、加圧加熱処理して得た絶縁板(積層板)の両面または片面に銅箔12を張り付けたものである。ここではガラス布にエポキシ樹脂を含浸させたもの、例えばNEM A規格FR-4の両面銅張り積層板を用いる。この銅箔12、12には公知のフォトエッティング法によって適宜の第1回路パターンが形成される。そして銅張り積層板10の両面に感光性絶縁樹脂、例えばエポキシアクリレート系の樹脂を塗布し、絶縁層30を形成する。こうして得られた積層体32を低温の恒温槽に入れ、樹脂の溶媒中に含まれる揮発性有機溶剤を除いて乾燥させ、膜質を適当地硬化させる(図2の(A))。

【0004】次に、この積層体32の表面にピアホールのパターンを焼付けたフォトマスク34を密着させ、あ

るいは僅かに離して位置合わせを行い、適切な波長の光(通常紫外線(UV)の光線を用いる)を照射して露光する(図2の(B))。この結果ピアホールのパターンの下の絶縁層30は硬化せず、ピアホールのパターン以外の部分の絶縁層30が硬化する。

【0005】そしてアルカリ性溶剤の現像液で現像して未硬化部分(可溶部分)を取り去れば、フォトマスク34に焼付けられたピアホールのパターンに一致する小孔36、すなわちピアホール用の小孔36が形成される(図2の(C))。

【0006】次に、絶縁層30の表面に形成する第2導体層と絶縁層30との密着性を向上させるために、絶縁層30の表面に化学研磨を施し、絶縁層30の表面を粗化する。(図2の(D))。次に、絶縁層30の粗化表面に無電解銅めっき処理を施し、第1銅めっき層38を形成する。この第1銅めっき層38と樹脂層30の密着性を向上させるためにベーリング処理を施す。(図2の(E))。次に、第1銅めっき層38の表面に電解銅めっき処理を施し、第2銅めっき層42を形成する。(図2の(F))。こうして、絶縁層30の上に第1銅めっき層38、第2銅めっき層42からなる第2導体層44が形成され、ピアホール40が形成される。

【0007】なお表面の第2導体層44にはフォトエッティング法などにより適宜の第2回路パターンを形成することができる。また同様の手順を繰り返して積層数を増やすことができる。

## 【0008】

【発明が解決しようとする課題】上記のように絶縁層の表面を粗化することで絶縁層と第2導体層との密着性を向上させたビルドアッププリント配線板の製造が可能となる。しかしながら、この方法で製造されたビルドアッププリント配線板の絶縁層と第2導体層との密着強度は0.8kg/cm以下で、密着信頼性が十分でないという問題点があった。本発明は、上記課題を解決するためになされたもので、絶縁層の粗化表面に酸性無電解銅めっき処理を施すことにより形成された金属めっき膜を備えるビルドアッププリント配線板を提供することを第1の目的とし、その製造方法を提供することを第2の目的とする。

## 【0009】

【課題を解決するための手段】本発明は、絶縁層30の表面を化学研磨して粗化した後、無電解銅めっき処理を施すこと、および絶縁層30がアルカリ現像型であることに着目してなされたものである。即ち、無電解銅めっき処理はPH1.2~1.3の強アルカリ性めっき液中でなされるので、めっき析出と同時に絶縁層30の粗化表面が強アルカリ性めっき液で浸食され、この粗化表面に表面凹凸ダレが生じ、このため密着強度が低下するものであるという推定に基づくものである。そこで、絶縁層30の粗化表面に酸性の無電解銅めっき処理を施し、金

属めっき膜を形成することとした。この金属めっき膜を保護膜として前記粗化表面が直接無電解銅めっき処理時の強アルカリ性めっき液に接触しないようにするためである。

【0010】本発明によれば、第1の目的は、ビルトアッププリント配線板において、少なくとも一方の面に第1回路パターンが形成された絶縁基板と、この第1回路パターンの上に積層された絶縁層と、この絶縁層の上に酸性無電解金属めっき処理を施すことにより形成された金属めっき膜と、この金属めっき膜の上に形成された第2回路パターンとを有することを特徴とするビルトアッププリント配線板、により達成される。

【0011】また、第2の目的はビルトアッププリント配線板の製造方法において、

- a. 第1回路パターンを形成した銅張り積層板にアルカリ現像型の感光性絶縁樹脂を積層して絶縁層を形成し、
- b. この絶縁層の表面を粗化し、
- c. この絶縁層の粗化表面に酸性無電解金属めっきを施して金属めっき膜を形成し、
- d. この金属めっき膜の上に銅めっきを施して銅めっき層を形成することを特徴とするビルトアッププリント配線板の製造方法、により達成される。

【0012】

【発明の実施の形態】図1は本発明によるビルトアッププリント配線板の製造法の1実施形態を示す図である。この実施形態では絶縁層の粗化表面を保護するために酸性無電解ニッケルめっき処理を施すことによりニッケルめっき膜を形成している。

【0013】まず前記図2で用いたものと同様な銅張り積層板10を用意する。これは絶縁基板の両面に銅箔12を張り付け、第1回路パターンを形成したものである。この銅張り積層板10の両面にはアルカリ現像型の感光性絶縁樹脂、例えばエポキシアクリレート系の樹脂を塗布し、乾燥させて適度に硬化させることにより絶縁層30を形成する(図1の(A))。この工程(A)から(D)までは、前記図2に示した工程と同じであるから、同一部分に同一符号を付し、その説明は繰り返さない。

【0014】図2の工程と異なるのは、工程(D)における表面粗化の後、酸性無電解ニッケルめっき処理を施し、ニッケルめっき膜50を形成する点である(図1の(E))。このニッケルめっき膜50の膜厚は、絶縁層30の粗化表面が後工程の無電解銅めっき処理時に強アルカリ性めっき液に直接接触しないようにする目的であること、また後工程の第2回路パターンを形成するまでのフォトエッチング時に十分エッチング可能であることを考慮して決定される。この酸性無電解ニッケルめっき処理のめっき液としては、例えば、PH4~5

で、塩化ニッケルを30g/リットル、次亜リン酸ナトリウム10g/リットル、クエン酸ナトリウム10g/リットルを含んでいるめっき液が用いられる。

【0015】続いて、図2の(E)、(F)と同様に、ニッケルめっき膜50の表面に無電解銅めっき処理を施し、次に第1銅めっき層38を形成した後ベーリング処理を施し(図1の(F))、第1銅めっき38層の表面に電解銅めっき処理を施し、第2銅めっき層42を形成する(図1の(G))。こうして、第1銅めっき層3

- 10 8、第2銅めっき層42からなる第2導体層44を形成し、ピアホール40を形成する。なお表面の第2導体層44にはフォトエッチング法などにより適宜の第2回路パターンを形成することができる。また同様の手順を繰り返して積層数を増やすことができる。

【0016】このようにして得られたビルトアッププリント配線板では絶縁層と導体層との密着強度は1.2kg/cm以上となり、多層プリント配線板として十分な密着性が確保できた。なお、絶縁層の表面粗化後の酸性無電解金属めっきはニッケルに限るものではなく、ニッケル合金(Ni-Co-P)、クロムなどでも良い。

【0017】

【発明の効果】請求項1の発明によれば、以上説明したように、絶縁層の粗化表面に酸性無電解金属めっき処理で金属めっき膜を形成することにしたので、無電解銅めっき処理時に絶縁層の表面が直接強アルカリ性めっき液に接触しなくなる。このため粗化表面はアルカリ性めっき液で浸食されなくなるので、表面凹凸ダレが発生しないから、絶縁層と導体層の密着性が向上し、密着強度として1.2kg/cm以上の優れた信頼性をもったビルトアッププリント配線板を提供できる。また、請求項2の発明によれば、このビルトアッププリント配線板の製造方法を提供できる。

#### 【図面の簡単な説明】

【図1】本発明によるビルトアッププリント配線板の製造法の1実施形態を示す図である。

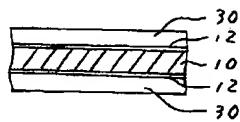
【図2】従来のビルトアップ法による多層プリント配線板の製造工程を示す図である。

#### 【符号の説明】

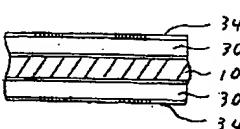
- 10 銅張り積層板
- 12 銅箔
- 30 絶縁層
- 34 マスクフィルム
- 36 フォトピアホール用小孔
- 38 第1銅めっき層
- 40 ピアホール
- 42 第2銅めっき層
- 50 ニッケルめっき膜

【図1】

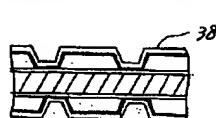
(A) 光硬化性樹脂の塗布



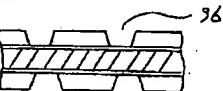
(B) 露光



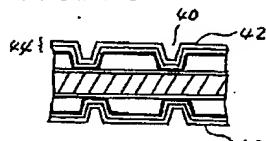
(F) 振電解鋼めっき、ペーリング



(C) 現像



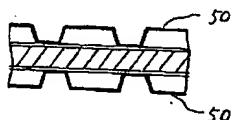
(G) 電解鋼めっき



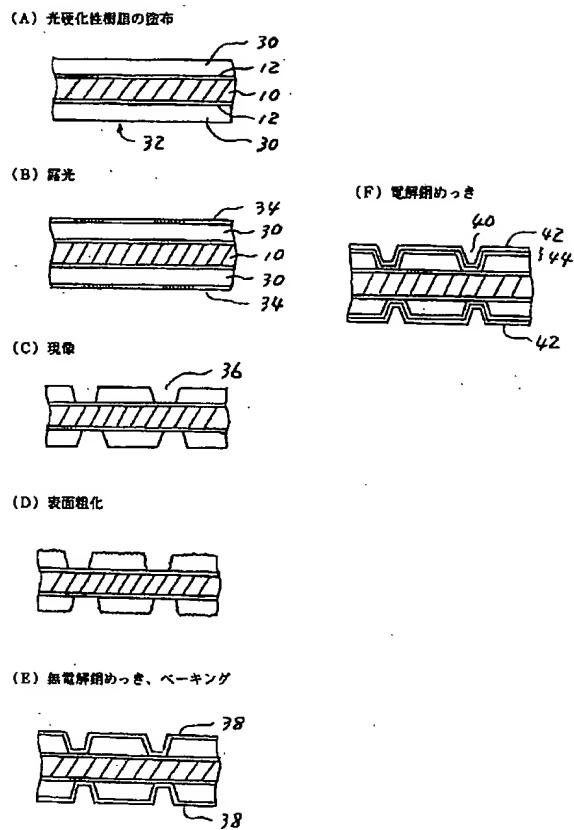
(D) 表面粗化



(E) 振電解ニッケルめっき



【図2】



## PATENT ABSTRACTS OF JAPAN

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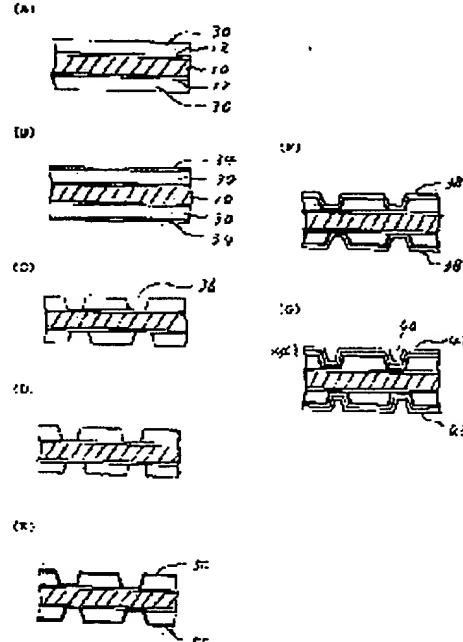
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 (72)Inventor : TOZAWA YOSHIHIKO

## (54) BUILD-UP PRINTED WIRING BOARD AND ITS MANUFACTURING METHOD

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To prevent the surface of an insulation layer from directly contacting a strong alkali plating liquid on electroless copper plating treatment by forming a metal plating film on the roughening surface of the insulation layer by oxidation electroless metal plating treatment.

**SOLUTION:** In a copper-clad lamination plate 10, a copper foil 12 is laminated on both surfaces of an insulation substrate, thus forming a first circuit pattern. An alkali development type photosensitive insulation resin is applied to the inner surface of the copper-clad lamination plate 10 and is dried and cured properly, thus forming an insulation layer 30. Then, after the surface roughening, oxidation electroless nickel plating treatment is performed, thus forming a nickel plating film 50. The thickness of the nickel plating film 50 is determined by considering that the roughening surface of the insulation layer 30 does not directly contact a strong alkali plating liquid on later-process electroless copper plating treatment.



## LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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## CLAIMS

[Claim(s)]

[Claim 1] The build up printed wired board characterized by having the insulating substrate by which the 1st circuit pattern was formed in one [ at least ] field, the insulating layer by which the laminating was carried out on this 1st circuit pattern, the metal plating film formed by performing acid radio solution metal plating processing on this insulating layer, and the 2nd circuit pattern formed on this metal plating film in a build up printed wired board.

[Claim 2] In the manufacture approach of a build up printed wired board, carry out the laminating of the photosensitive insulation resin of an alkali development mold to the copper-clad laminate in which the a. 1st circuit pattern was formed, and an insulating layer is formed. b. — the front face of this insulating layer — roughening — c. — the roughening front face of this insulating layer — acid radio solution metal plating processing — giving — the metal plating film — forming — d. — the manufacture approach of the build up printed wired board characterized by what copper-plating processing is performed and the 2nd conductor layer is formed for on this metal plating film.

[Translation done.]

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## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

[0001]

[Field of the Invention] the insulating layer and conductor which this invention requires for a build up printed wired board, especially become by the photosensitive insulation resin of an alkali development mold — it is related with the technique which raises adhesion with a circuit.

[0002]

[Description of the Prior Art] in the manufacture approach of a multilayer printed wiring board, the build up method which accumulates a circuit pattern and an insulating layer on one [ at least ] field of an insulating substrate one by one is well-known, the insulating layer and conductor which become by insulating resin in this build up method — in order to raise adhesion with a circuit, chemical polishing of the front face of this insulating layer is carried out, and it is roughened.

[0003] Drawing 2 is drawing showing the production process of the multilayer printed wiring board by the build up method. In drawing 2, 10 is a copper-clad laminate and sticks copper foil 12 on obtained both sides or one side of an electric insulating plate (laminate) which put the sheet (prepreg) into which resin was infiltrated on reinforcement base materials, such as paper and a glass fiber, and carried out pressurization heat-treatment. Here, that into which the epoxy resin was infiltrated, for example, the double-sided copper-clad laminate of NEMA specification FR-4, is used for a glass fabric. The proper 1st circuit pattern is formed in this copper foil 12 and 12 by the well-known photo etching method. And photosensitive insulation resin, for example, the resin of an epoxy acrylate system, is applied to both sides of the copper-clad laminate 10, and an insulating layer 30 is formed. In this way, put the obtained layered product 32 into a low-temperature thermostat, it is made to dry except for the volatile organic solvent contained in the solvent of resin, and membranous quality is stiffened suitably ((A) of drawing 2).

[0004] Next, the photo mask 34 which was able to be burned in the pattern of a beer hall is stuck on the front face of this layered product 32, or it detaches slightly and alignment is performed, and the light (the beam of light of ultraviolet rays (UV) is usually used) of suitable wavelength is irradiated, and is exposed ((B) of drawing 2). As a result, the insulating layer 30 under the pattern of a beer hall does not harden, but the insulating layer 30 of parts other than the pattern of a beer hall hardens it.

[0005] If negative are developed with the developer of an alkaline solvent and a part for a non-hard spot (meltable part) is removed, the stoma 38 36 which is in agreement with the pattern of the beer hall baked on the photo mask 34, i.e., the stoma for beer halls, will be formed ((C) of drawing 2).

[0006] Next, in order to raise the adhesion of the 2nd conductor layer and insulating layer 30 which are formed in the front face of an insulating layer 30, chemical polishing is performed to the front face of an insulating layer 30, and the front face of an insulating layer 30 is roughened. ((D) of drawing 2). Next, non-electrolytic copper plating processing is performed to the roughening front face of an insulating layer 30, and the 1st copper-plating layer 38 is formed in it. Baking processing is performed in order to raise the adhesion of this 1st copper-plating layer

38 and the resin layer 30. ((E) of drawing 2). Next, electrolytic copper plating processing is performed to the front face of the 1st copper-plating layer 38, and the 2nd copper-plating layer 42 is formed in it. ((F) of drawing 2). In this way, on an insulating layer 30, the 2nd conductor layer 44 which consists of the 1st copper-plating layer 38 and the 2nd copper-plating layer 42 is formed, and a beer hall 40 is formed.

[0007] In addition, the proper 2nd circuit pattern can be formed in the 2nd surface conductor layer 44 by the photo etching method etc. Moreover, the same procedure can be repeated and the number of laminations can be increased.

[0008]

[Problem(s) to be Solved by the Invention] Manufacture of the build up printed wired board which raised the adhesion of an insulating layer and the 2nd conductor layer by roughening the front face of an insulating layer as mentioned above is attained. However, the adhesion reinforcement of the insulating layer of a build up printed wired board and the 2nd conductor layer which were manufactured by this approach is 0.8 or less kg/cm, and had the trouble that adhesion dependability was not enough. This invention was made in order to solve the above-mentioned technical problem, it sets it as the 1st purpose to offer a build up printed wired board equipped with the metal plating film formed by performing acid radio solution metal plating processing to the roughening front face of an insulating layer, and sets it as the 2nd purpose to offer the manufacture approach.

[0009]

[Means for Solving the Problem] This invention is made paying attention to performing non-electrolytic copper plating processing and an insulating layer 30 being an alkali development mold, after carrying out chemical polishing of the front face of an insulating layer 30 and roughening it. That is, since non-electrolytic copper plating processing is made in the strong-base nature plating liquid of pHs 12-13, the roughening front face of an insulating layer 30 corrodes with strong-base nature plating liquid to a plating deposit and coincidence, surface irregularity sagging arises on this roughening front face, and it is based on presumption that it is that to which adhesion reinforcement falls for this reason. Then, we decided to perform acid non-electrolytic metal plating processing to the roughening front face of an insulating layer 30, and to form the metal plating film in it. It is for masking it said roughening front face not contact the strong-base nature plating liquid at the time of direct non-electrolytic copper plating processing by using this metal plating film as a protective coat.

[0010] According to this invention, the 1st purpose is set to a build up printed wired board. The insulating substrate by which the 1st circuit pattern was formed in one [ at least ] field, and the insulating layer by which the laminating was carried out on this 1st circuit pattern, it is attained more by the build up printed wired board characterized by having the metal plating film formed by performing acid radio solution metal plating processing on this insulating layer, and the 2nd circuit pattern formed on this metal plating film.

[0011] Moreover, the 2nd purpose is set to the manufacture approach of a build up printed wired board. a. Carry out the laminating of the photosensitive insulation resin of an alkali development mold, the copper-clad laminate in which the 1st circuit pattern was formed, and an insulating layer is formed. Perform acid radio solution metal plating to the roughening front face of this insulating layer, and the metal plating film is formed in it. b. — the front face of this insulating layer — roughening — c. — d. It is attained more by the manufacture approach of the build up printed wired board characterized by what copper plating is given and a copper-plating layer is formed for on this metal plating film.

[0012]

[Embodiment of the Invention] Drawing 1 is drawing showing 1 operation gestalt of the manufacturing method of the build up printed wired board by this invention. With this operation gestalt, in order to protect the roughening front face of an insulating layer, the nickel-plating film is formed by performing acid radio solution nickel-plating processing.

[0013] The same copper-clad laminate 10 as what was first used by said drawing 2 is prepared. This sticks copper foil 12 on both sides of an insulating substrate, and forms the 1st circuit pattern. The photosensitive insulation resin of an alkali development mold, for example, the resin

of an epoxy acrylate system, is applied to both sides of this copper-clad laminate 10, and an insulating layer 30 is formed in them by making it dry and making it harden moderately ((A) of drawing 1). Since it is the same as the process shown in said drawing 2, this process (A) to (D) gives the same sign to the same part, and does not repeat that explanation.

[0014] Differing from the process of drawing 2 is a point which performs acid radio solution nickel-plating processing after surface roughening in a process (D), and forms the nickel-plating film 50 in consideration of the ability to etch [ that it is the purpose to make it the roughening front face of an insulating layer 30 not contact strong-base nature plating liquid directly at the time of non-electrolytic copper plating processing of a back process, and ] enough at the time of photo etching when forming the 2nd circuit pattern of a back process. As plating liquid of this acid radio solution nickel-plating processing, it is pHs 4-5 and the plating liquid containing 30g [ l. ] / . 10g [ l. ] sodium hypophosphite, and a 10g [ l. ] sodium citrate is used in a nickel chloride, for example.

[0015] Then, like (E) of drawing 2, and (F), non-electrolytic copper plating processing is performed to the front face of the nickel-plating film 50, after forming the 1st copper-plating layer 38 next, baking processing is performed ((F) of drawing 1), electrolytic copper plating processing is performed to the front face of the 38 layers of the 1st copper plating, and the 2nd copper-plating layer 42 is formed ((G) of drawing 1). In this way, the 2nd conductor layer 44 which consists of the 1st copper-plating layer 38 and the 2nd copper-plating layer 42 is formed, and a beer hall 40 is formed. In addition, the proper 2nd circuit pattern can be formed in the 2nd surface conductor layer 44 by the photo etching method etc. Moreover, the same procedure can be repeated and the number of laminations can be increased.

[0016] Thus, in the obtained build up printed wired board, the adhesion reinforcement of an insulating layer and a conductor layer became 1.2 or more kg/cm, and has secured adhesion sufficient as a multilayer printed wiring board. In addition, the acid radio solution metal plating after surface roughening of an insulating layer may not be restricted to nickel, and a nickel alloy (nickel-Co-P), chromium, etc. are sufficient as it.

[0017]

[Effect of the Invention] Since according to invention of claim 1 it decided to form the metal plating film in the roughening front face of an insulating layer by acid radio solution metal plating processing as explained above, the front face of an insulating layer stops contacting direct strong-base nature plating liquid at the time of non-electrolytic copper plating processing. For this reason, since alkaline plating liquid will not corrode a roughening front face and surface irregularity sagging does not occur, the adhesion of an insulating layer and a conductor layer improves and the build up printed wired board which had the outstanding dependability of 1.2 or more kg/cm as adhesion reinforcement can be offered. Moreover, according to invention of claim 2, the manufacture approach of this build up printed wired board can be offered.

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## DESCRIPTION OF DRAWINGS

## [Brief Description of the Drawings]

[Drawing 1] It is drawing showing 1 operation gestalt of the manufacturing method of the build up printed wired board by this invention.

[Drawing 2] It is drawing showing the production process of the multilayer printed wiring board by the conventional build up method.

## [Description of Notations]

10 Copper-clad Laminate  
12 Copper Foil  
30 Insulating Layer  
34 Mask Film  
36 Stoma for Photograph Beer Halls  
38 1st Copper-Plating Layer  
40 Beer Hall  
42 2nd Copper-Plating Layer  
50 Nickel-Plating Film

[Translation done.]